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FLOOD INSURANCE STUDY

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VILLAGE OF DEERFIELD, MICHIGAN

LENAWEE COUNTY

OCTOBER 1, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 260438

FEM 1-209:

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

VILLAGE OF DEERFIELD, LENAWEE COUNTY, MICHIGAN

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Deerfield, Lenawee County, Michigan, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Village of Deerfield to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by McNamee, Porter and Seeley, and Smith, Hinchman and Grylls Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4705. This study was completed in November 1979.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the Study Contractor, the FIA, and representatives of the Village of Deerfield in March 1978. Results of the hydrologic and hydraulic analyses were coordinated with the Michigan Department of Natural Resources, Water Management Division (DNR), which is the designated State Coordinating Agency.

During the search for basic data, contacts were made with Deerfield, the DNR, the U.S. Army Corps of Engineers (COE), the Soil Conservation Service (SCS), the U.S. Geological Survey (USGS), the Michigan Department of Transportation, the Great Lakes Basin Commission, the Lenawee County Drain Commission, the Lenawee County Region II Planning Commission, and the Advance Newspaper.

On May 5, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, the FIA, and community officials.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Deerfield. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through 1984.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the Village of Deerfield.

Floods caused by the overflow of River Raisin along the southern corporate limit and Camp Brenott Drain from its confluence with the River Raisin to the upstream corporate limit were studied in detail.

2.2 Community Description

The Village of Deerfield is located in the southeastern portion of Michigan in the eastern portion of Lenawee County. The Village of Deerfield is bordered on the east by the Township of Summerfield, and on the north, south, and west by the Township of Deerfield. The Village of Deerfield is bordered on three sides by the unincorporated areas of Lenawee County. The total land area contained within the village limits is 0.9 square mile. It is situated approximately 60 miles southwest of Detroit, Michigan, and 35 miles south of Ann Arbor, Michigan. According to U.S. Census Bureau figures, the population has increased from 834 in 1970 to 897 in 1975 (Reference 1).

Because of its proximity to Lake Erie, the village has a humid, temperate climate. There is a USGS Weather Bureau Station at Adrian approximately 15 miles west of the Village of Deerfield. The average temperature in Adrian in the winter is about 26 degrees Fahrenheit (F.). The average temperature in summer is about 71 degrees F. (Reference

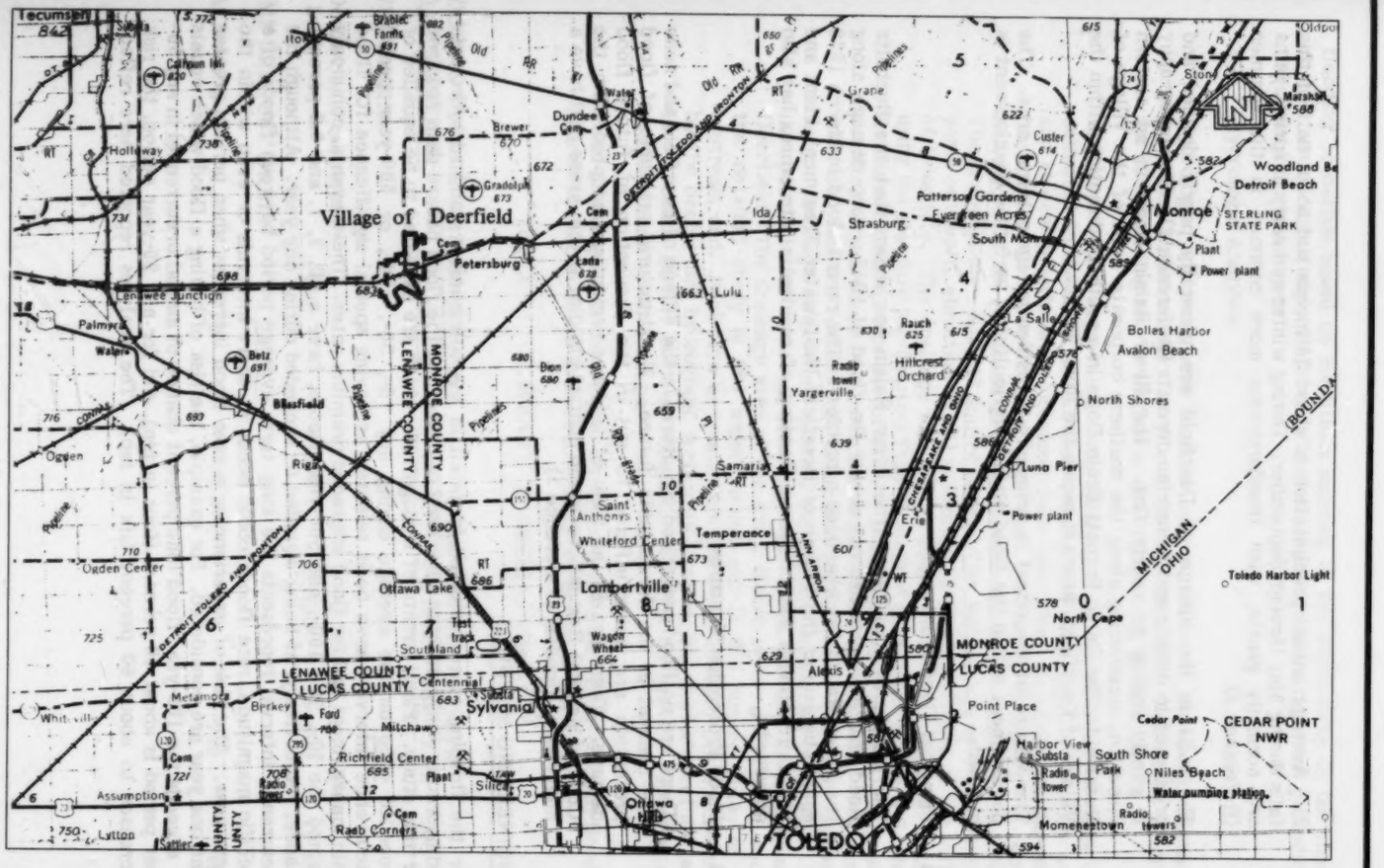

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF DEERFIELD, MI
(LENAWEE COUNTY)

APPROXIMATE SCALE
4 0 4 8 12 MILES

VICINITY MAP

2). Average annual precipitation is about 34 inches and about half of this falls during May through September. During winter and early in spring, rains are normally gentle, with thunderstorms more common in the summer (Reference 3).

The soils in the Village of Deerfield are generally poorly drained and originated in deltaic and lacustrine deposits (Reference 2). The topography is gently rolling to nearly flat. The River Raisin flows in an eastern direction, meandering along the southern corporate limit of the Village of Deerfield. The Camp Brenott Drain flows in a southern direction within the Village of Deerfield, where it meets the River Raisin.

The Village of Deerfield is primarily a residential-agricultural area. The development within the flood plain is agricultural; no future development is planned.

2.3 Principal Flood Problems

The history of flooding on the River Raisin has shown that the Bucholtz Road bridge was washed out during the flood of 1947. Crop damage along the River Raisin has also been a problem. The recent flood in March 1978 caused backup at the Village of Deerfield Wastewater Treatment Plant and Water Treatment Plant. Some flooding of residential structures has also occurred.

2.4 Flood Protection Measures

There are no flood protection structures in the Village of Deerfield and none are planned in the foreseeable future. Nonstructural measures of flood protection are being utilized to aid in the prevention of future flood damage. These are in the form of land use regulations adopted from the Code of Federal Regulations which control building within areas that have a high risk of flooding (Reference 3).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect

flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Annual peak discharge values were obtained from the USGS streamflow data collected on the River Raisin near Monroe and near Adrian. Drainage areas and stream lengths were obtained from the River Raisin Basin Gazetteer (Reference 4). The Monroe gage (no. 041765000, 41 years of record, elevation 616.36) is located 27 miles downstream of the Village of Deerfield. The drainage area is 1,042 square miles. The Adrian gage (no. 04176000, 31 years of record, elevation 693.2) is located 35 miles upstream of the Village of Deerfield. The drainage area is 463 square miles. A statistical analysis using the standard log-Pearson Type III method as outlined by the U.S. Water Resources Council was performed for both gages (Reference 5). The skew coefficient was taken from the skew map provided by the DNR. The outlier test used was the revised test developed by the DNR. The peak discharges versus drainage area were plotted on log-log paper and a straight line interpolation was used to determine the flows on the River Raisin at Deerfield. The drainage area of the River Raisin at the downstream end of the detailed study is 686 square miles and is 677 square miles at the upstream end. Peak flow estimates for the Camp Brenott Drain were made by the Brater unit hydrograph method (Reference 6). Brater's method takes into account factors such as population density, infiltration capacity, and rainfall intensity-duration patterns.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
RIVER RAISIN					
Downstream corporate limit	686	6,300	8,200	9,000	10,600
CAMP BRENOTT DRAIN					
At mouth	7.4	420	640	730	960

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections for the backwater analyses of the River Raisin and Camp Brenott Drain were obtained from field surveys. All bridges and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were based on engineering judgment and field observations of the streams and flood plain areas. Roughness values for the main channel of the River Raisin ranged from 0.055 to 0.065 with flood plain roughness values ranging from 0.085 to 0.16 for all floods. The roughness values for the main channel of the Camp Brenott Drain ranged from 0.05 to 0.065 with flood plain roughness values ranging from 0.085 to 0.09 for all floods.

Starting water-surface elevations for the River Raisin and Camp Brenott Drain were calculated using the slope-area method. Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (References 7, 8, and 9). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using a topographic map enlarged to a scale of 1:4800, with a contour interval of five feet (Reference 10).

The approximate flood elevation was extrapolated from the detailed study and the boundary was delineated using the same topographic map referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. In Michigan, though, under Michigan Act 245, Public Acts of 1929, as amended by Act 167, Public Acts of 1968, encroachment in the flood plain is limited to that which will cause only an insignificant increase in flood heights (Reference 11). Thus, at the recommendation of the Bureau of Water Management, a floodway having no more than a 0.1-foot surcharge has been delineated for this study.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are showr in Figure 2.

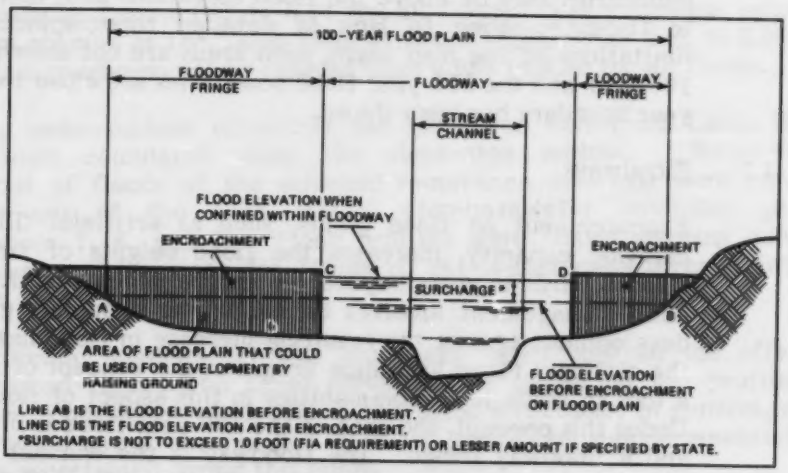
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the Village of Deerfield.

FLOODING SOURCE		FLOODWAY		
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEA VELOC (FEET/S
RIVER RAISIN				
A	1600	160/ 30[3]	2370	3.8
B	2510	175/ 20[3]	3009	3.0
C	4000	1130/1000[3]	7646	1.2
D	6100	2500/2370[3]	15,439	0.6
E	9590	1400/1260[3]	9240	1.0
F	11,975	1280/ 80[3]	9525	1.0
CAMP BRENOTT DRAIN				
A	150[2]	80/ 20[3]	267	2.7
B	550[2]	150	472	1.6
C	620[2]	140	201	3.6
D	660[2]	150	468	1.5
E	800[2]	175	917	0.8
F	1125[2]	150	582	1.3
G	1650[2]	274	811	0.9
H	1950[2]	90	926	0.8
I	2050[2]	75	973	0.8
J	2410[2]	75	889	0.8
K	3760[2]	80	733	1.0

[1]FEET ABOVE LIMIT OF FLOODING AFFECTING COMMUNITY 2500 FEET DOWNSTREA
[2]FEET ABOVE CONFLUENCE WITH RIVER RAISIN
[3]TOTAL WIDTH / WIDTH WITHIN CORPORATE LIMITS
[4]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM RIVER RAISIN

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF DEERFIELD, MI

(LENAWEE CO.)

	BASE FLOOD WATER SURFACE ELEVATION			
Y C.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
	670.9	670.9	670.9	0.0
	671.6	671.6	671.6	0.0
	672.2	672.2	672.2	0.0
	672.5	672.5	672.5	0.0
	673.1	673.1	673.1	0.0
	673.7	673.7	673.7	0.0
	671.6	663.5[4]	663.5	0.0
	671.6	664.0[4]	664.0	0.0
	671.6	664.6[4]	664.6	0.0
	671.6	664.7[4]	664.7	0.0
	671.6	664.8[4]	664.8	0.0
	671.6	664.9[4]	664.9	0.0
	671.6	665.4[4]	665.4	0.0
	676.2	676.2	676.2	0.0
	676.3	676.3	676.3	0.0
	676.3	676.3	676.3	0.0
	676.3	676.3	676.3	0.0

OF BUCHOLTZ ROAD

FLOODWAY DATA

RIVER RAISIN - CAMP BRENOTT DRAIN

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the sar flood hazard, based on the average weighted difference in water-surfa elevations between the 10- and 100-year floods. This difference does n have a variation greater than that indicated in the following table for mo than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the Village of Deerfield a shown on the Flood Profiles (Exhibit 1) and are summarized in the Flo Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate table Correlations between property damage from floods and their FHFs are us to set actuarial insurance premium rate tables based on FHFs from 005 200.

The FHF for a reach is the average weighted difference between the 10- a 100-year flood water-surface elevations expressed to the nearest 0.5 foo and shown as a three-digit code. For example, if the difference betwe water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FH is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5 feet, the FHF is 050. When the difference between the 10- and 100-ye water-surface elevations is greater than 10.0 feet, accuracy for the FHF to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the enti incorporated area of the Village of Deerfield was divided into zones, ea having a specific flood potential or hazard. Each zone was assigned one the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated the 100-year flood, determined by appro imate methods; no base flood elevatio are shown or FHFs determined.

Zones A5, A15:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Deerfield is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

The Flood Insurance Study for the Township of Summerfield, Michigan, agrees completely with this study (Reference 12).

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 13). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

FLOODING SOURCE	PANEL[1]	ELEVATIO BETWEEN 1.0% (1	
		10% (10-YEAR)	(5
RIVER RAISIN			
REACH 1	0001	–2.5	
CAMP BRENOTT DRAIN			
REACH 1	0001	–7.4	

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF DEERFIELD, MI

(LENAWEE CO.)

DIFFERENCE[2] (-YEAR) FLOOD AND		FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
% (EAR)	0.2% (500-YEAR)			
0.7	1.1	025	A5	VARIES–SEE MAP
-0.6	0.5	075	A15	VARIES–SEE MAP

FLOOD INSURANCE ZONE DATA

RIVER RAISIN - CAMP BRENOTT DRAIN

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

8.0 REFERENCES AND BIBLIOGRAPHY

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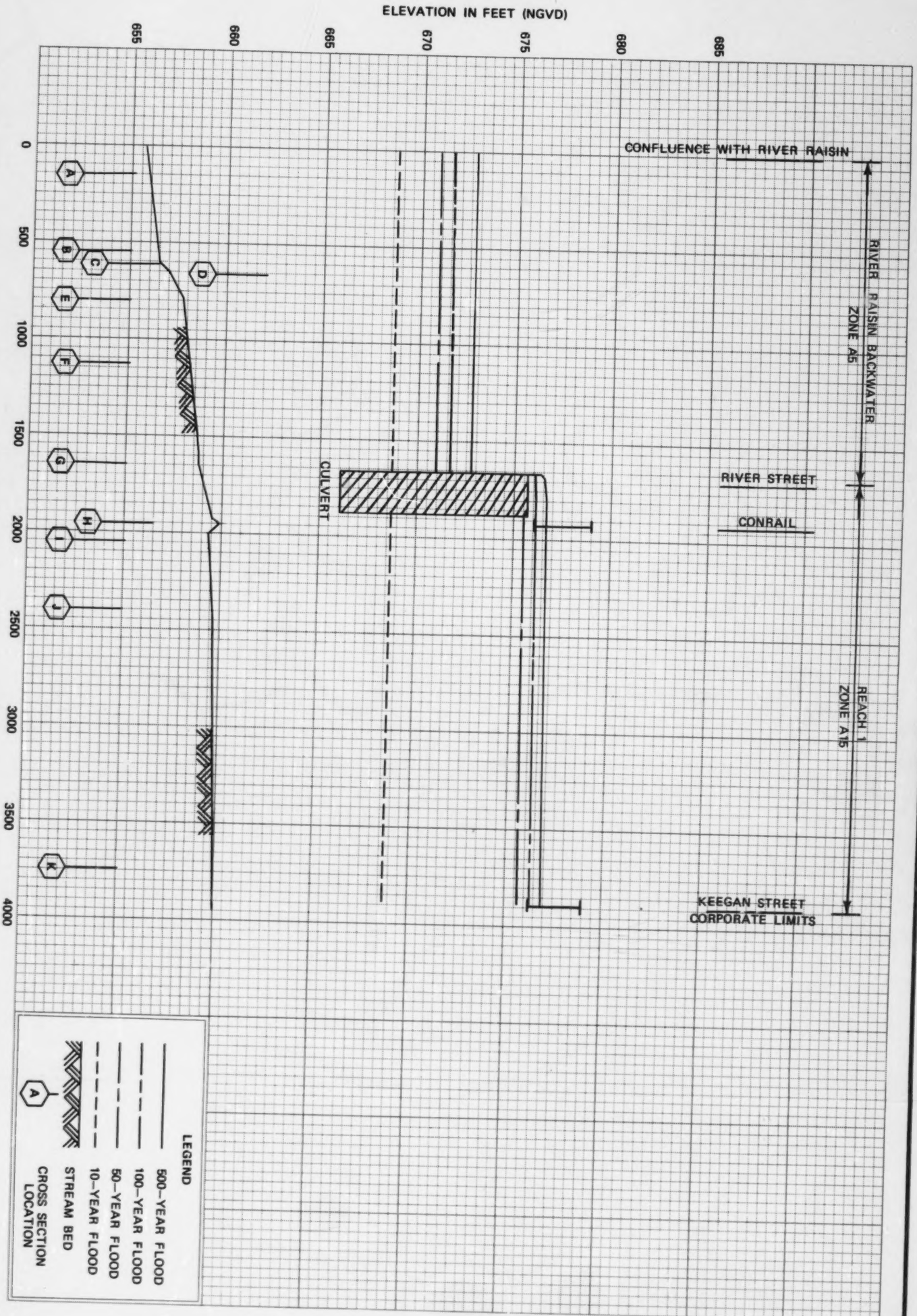
FLOOD PROFILES

RIVER RAISIN

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
VILLAGE OF DEERFIELD, MI
(LENAWEE CO.)

01P



02P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
VILLAGE OF DEERFIELD, MI
(LENAWEE CO.)

FLOOD PROFILES

CAMP BRENOTT DRAIN